

ANALISIS PENGARUH POLUSI TERHADAP DISTRIBUSI MEDAN LISTRIK ISOLATOR KERAMIK U120B PADA SISTEM 150 KV MENGGUNAKAN SIMULASI COMSOL *MULTIPHYSICS*

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ABSTRAK

Polusi pada permukaan isolator saluran transmisi dapat menyebabkan ketidakseragaman distribusi medan listrik yang berpotensi meningkatkan risiko *Flashover*. Penelitian ini bertujuan menganalisis pengaruh variasi distribusi polusi (*Top/Bottom ratio*), *Equivalent Salt Deposit Density* (ESDD), dan ketebalan lapisan polusi terhadap distribusi medan listrik pada isolator keramik U120B sistem transmisi 150 kV, serta menentukan jumlah keping isolator yang direkomendasikan berdasarkan kriteria *Specific Creepage Distance* (SCD) dan kuat medan listrik maksimum. Simulasi dilakukan menggunakan COMSOL *Multiphysics* dengan modul *Electric Currents* pada studi *Frequency Domain* 50 Hz. Lapisan polusi dimodelkan menggunakan pendekatan *Electric Shielding*. Hasil penelitian menunjukkan bahwa berdasarkan pendekatan pemodelan yang digunakan, variasi ESDD dan ketebalan lapisan polusi memberikan pengaruh yang relatif kecil terhadap distribusi medan listrik, sedangkan variasi rasio persebaran polusi memberikan pengaruh yang lebih dominan terhadap peningkatan konsentrasi medan listrik. Evaluasi jumlah keping menunjukkan bahwa konfigurasi minimum yang memenuhi kriteria adalah 15 keping, sedangkan dengan mempertimbangkan persyaratan SCD hingga kategori polusi sangat berat, konfigurasi 16 keping direkomendasikan sebagai konfigurasi akhir pada penelitian ini.

Kata Kunci: *COMSOL Multiphysics, distribusi medan Listrik, Equivalent Salt Deposit Density (ESDD), isolator keramik U120B, Top/Bottom ratio*

***ANALYSIS OF THE EFFECT OF POLLUTION ON THE
ELECTRIC FIELD DISTRIBUTION OF U120B CERAMIC
INSULATORS IN A 150 KV TRANSMISSION SYSTEM USING
COMSOL MULTIPHYSICS***

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ABSTRACT

Pollution on the surface of transmission line insulators may cause non-uniform electric field distribution, potentially increasing the risk of Flashover. This study aims to analyze the effects of pollution distribution (Top/Bottom ratio), Equivalent Salt Deposit Density (ESDD), and pollution layer thickness on the electric field distribution of U120B ceramic insulators in a 150 kV transmission system, as well as to determine the recommended number of insulator discs based on the Specific Creepage Distance (SCD) criterion and the maximum electric field. Simulations were conducted using COMSOL Multiphysics with the Electric Currents interface under a 50 Hz Frequency Domain study. The pollution layer was modeled using the Electric Shielding approach. The results indicate that, within the adopted modeling approach, variations in ESDD and pollution layer thickness have relatively minor effects on the electric field distribution, whereas variations in the Top/Bottom ratio have a more dominant influence on the concentration of the electric field. The insulator string evaluation shows that the minimum configuration satisfying the adopted criterion is 15 discs. However, when the SCD requirement for the very heavy pollution category is also considered, a configuration of 16 discs is recommended as the final configuration in this study.

Keywords: *COMSOL Multiphysics, electric field distribution, Equivalent Salt Deposit Density (ESDD), U120B ceramic insulator, Top/Bottom ratio*